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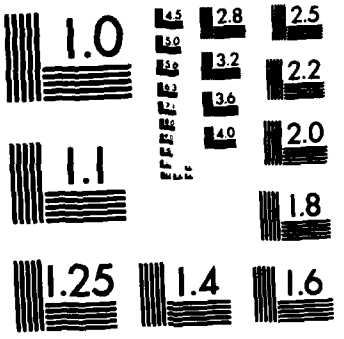

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INSTRUCTIONAL STRATEGY DIAGNOSTIC PROFILE TRAINING MANUAL: WORKSHOP EVALUATION

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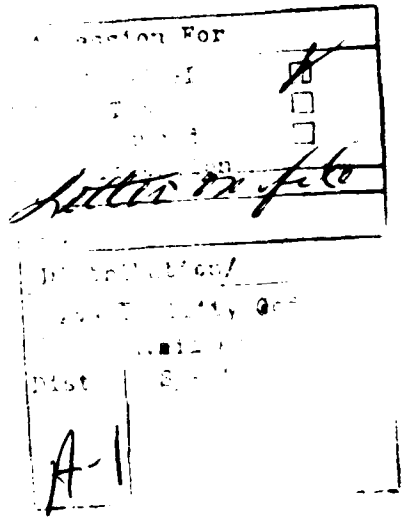
Special Report 78-17 September 1978

INSTRUCTIONAL STRATEGY DIAGNOSTIC PROFILE TRAINING MANUAL: WORKSHOP EVALUATION

Norman D. Wood
John A. Ellis
Wallace H. Wulfeck, II



Reviewed by
John D. Ford, Jr.

Approved by
James J. Regan
Technical Director

Navy Personnel Research and Development Center
San Diego, California 92152

FOREWORD

The Instructional Strategy Diagnostic Profile (ISDP) evaluation workshop was conducted in support of Navy Decision Coordinating Paper, Education and Training Development (NDCP-Z0108-PN), under subproject P.30A, Adaptive Experimental Approach to Instructional Design, and the sponsorship of the Chief of Naval Operations (OP-99). The workshop was held at the Navy Personnel Research and Development Center in August 1977, and was attended by representatives from Commander Training Command, Pacific; Chief of Naval Technical Training; Chief of Naval Education and Training; Chief of Naval Education and Training Support; and the Training Analysis and Evaluation Group.

The results of this effort will be provided as feedback to workshop participants and to other commands currently using or planning to use the ISDP. It is anticipated that a revised manual will be issued in the first quarter of FY79. An interim revision, entitled "An Interim Training Manual for the Instructional Quality Inventory" (NPRDC Technical Note 78-5 of February 1978), has already been issued.

DONALD F. PARKER
Commanding Officer

SUMMARY

Problem

The Navy Instructional Program Development Centers, under the Chief of Naval Education and Training Support, are tasked with analyzing, designing, and developing a large portion of the Navy's technical training courses. To facilitate accomplishment of this task, the Instruction Strategies Diagnostic Profile (ISDP) Training Manual was developed. The effectiveness of this manual as a training instrument must be evaluated in an operational setting.

Objective

The objective of this study was to evaluate the effectiveness of the ISDP Training Manual.

Approach

Twelve Navy civilian personnel familiar with instructional development techniques participated in a workshop on the ISDP Training Manual at the Navy Personnel Research and Development Center during August 1977.

Data were collected on the following variables: (1) lesson study time, (2) performance on practice items, (3) a test-objective consistency rating exercise, (4) an identification of primary presentation forms exercise, (5) a test-presentation consistency exercise, (6) a presentation adequacy exercise, (7) a final simulation exercise, and (8) a lesson opinion questionnaire.

Results

The results indicate that the manual was generally effective. However, participants had difficulty with some of the more complicated concepts and procedures.

Recommendations

1. Difficult portions of the manual should be revised.

2. Additional workshops should be given to test revisions.

3. The cost-effectiveness of the ISDP process should be evaluated by applying it to an existing Navy course. Analysis should be made of time required to apply the ISDP and student performance on the revised materials.

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INTRODUCTION

Problem

The Navy Instructional Program Development Centers, under the Chief of Naval Education and Training Support, are tasked with analyzing, designing, and developing a large portion of the Navy's technical training courses. To facilitate accomplishment of this task, the Instructional Strategy Diagnostic Profile (ISDP) was developed by Courseware, Inc. under contract to the Navy Personnel Research and Development Center.[1] The effectiveness of this manual as a training instrument must be evaluated in an operational setting.

Overview of ISDP

The ISDP is an analytic tool that facilitates the evaluation and revision of existing instruction and the design of new instruction. It consists of a set of prescriptions that allows the user to evaluate instruction logically and to prescribe revisions to increase its effectiveness.

The ISDP is designed to evaluate instructional materials on two main criteria: consistency and adequacy. First, consistency is determined and then adequacy is evaluated.

The consistency criterion is met if it is determined that the instructional objectives, test items, and the instructional presentation are consistent. This is accomplished in two steps. First, the instructional objectives and test items are classified on two dimensions: (1) the performance, or task level, required of the student and (2) the type of instructional content. These two dimensions form a task/content classification matrix, which is used to classify objectives, test items, and instructional presentation. This matrix is illustrated in Figure 1. If an objective and its corresponding test item can be classified in the same cell of the matrix, they are considered to be consistent. The second step involves rating the consistency between instruction and objective/test items. The ISDP requires that different components of instructional presentation, called primary presentation forms (PPFs), be present for different combinations of task levels and content type. If the PPF combination required for the task level and content type of each objective/test item is present, then the instruction is consistent with the objective/test items.

Once it has been determined that instructional materials are consistent, the adequacy criterion is assessed by determining whether or not the instructional presentation adequately communicates the "to-be-learned" information. During ISDP development, it was hypothesized that the following variables affected instructional adequacy:

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[1]Merrill, M. D., Richards, R. E., Schmidt, R., & Wood, N. D. Interim Training Manual for the Instructional Strategy Diagnostic Profile (NPRDC SR 77-14). San Diego: Navy Personnel Research and Development Center, September 1977.

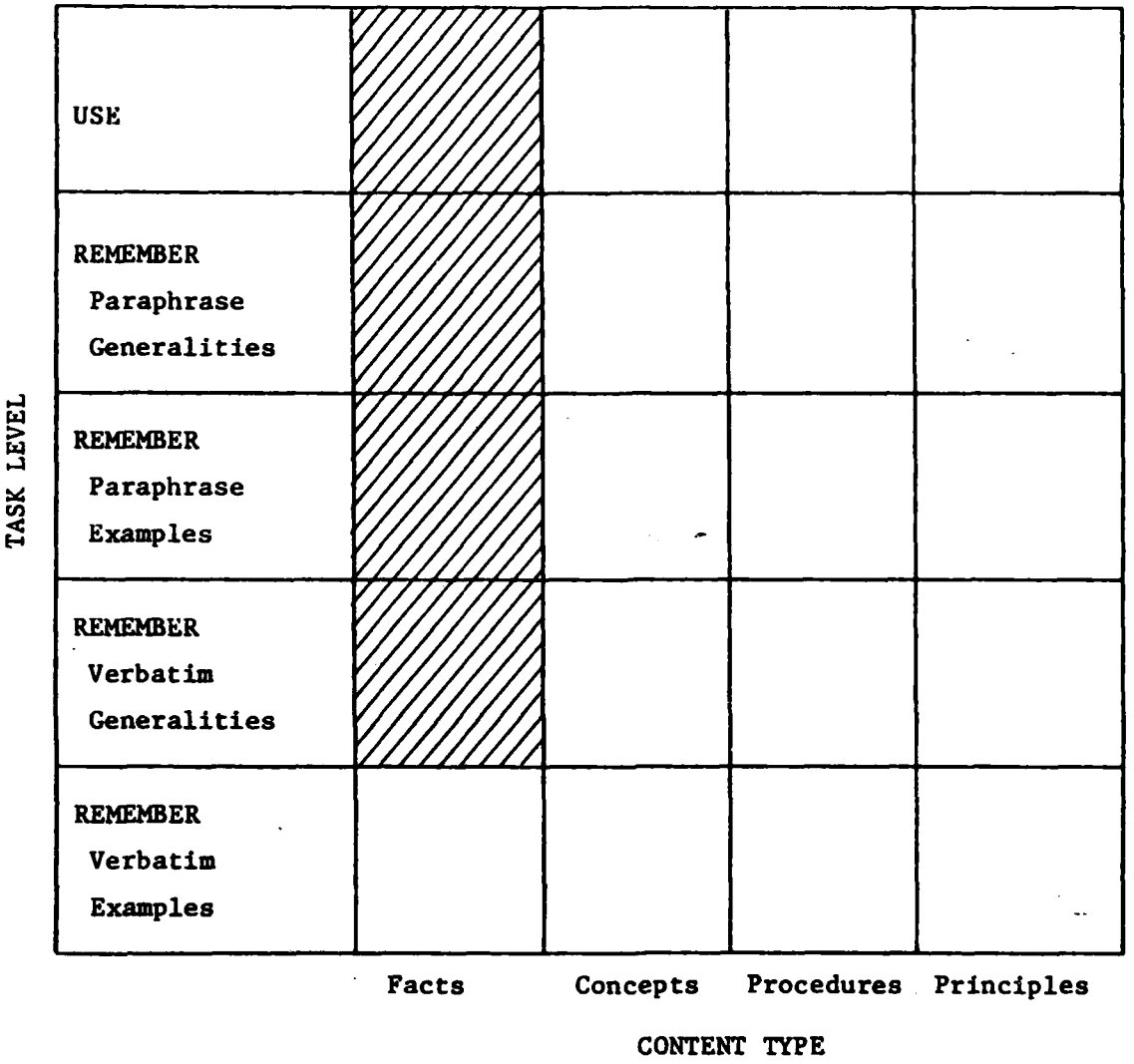

Figure 1. The task/content matrix for classification of objectives and test items.

1. Isolation (i.e., is the relevant information separated and clearly identified?).

2. Help (i.e., is explanatory or mnemonic information provided?).

3. Matching (i.e., are the examples and practice items matched?).

Thus, instruction is rated on these variables to obtain an adequacy index. Each PPF within the instruction may be rated as more or less adequate.

In the following paragraphs, the task/content matrix and the primary presentation forms are described in greater detail.

Task/Content Classification Matrix

As shown in Figure 1, the task dimension of the task/content classification matrix is comprised of several levels, the broadest of which are the task requirements Use and Remember. Use is defined as the act of applying a general relationship to a specific situation where it has not been previously applied; and remember, as the act of bringing to mind something that has been previously encountered. Thus, a use item (or objective) would require the student to respond by applying a generality to a newly encountered example; that is, one that has not been previously displayed to the student as part of the instructional presentation. A remember test item (or objective) would require the student to respond by recognizing or recalling a generality or example that has been previously encountered. Generality is defined as a statement or definition or relationship that can be applied to more than one specific object or event; and example, as a specific object or event or its representation that does or could exist in the real world.

The use level cannot be divided into sublevels--it always requires newly encountered examples. The reason for this is obvious--if an example has been previously encountered, the test item or objective would be classified at the remember level. The remember level, however, can be divided into sublevels--either paraphrase or verbatim. Paraphrase means equivalent in meaning but expressed in other words; verbatim, word for word or exactly the same. Thus, a paraphrase generality means that synonyms have been substituted for the substantive words (nouns, verbs, and modifiers of the original statement); and a paraphrase example, that the same object or event is presented but the form or representation used to exhibit this object or event has been modified. A verbatim generality/example requires the student to recognize or restate the same words that were used previously to present the generality/example. All paraphrase and verbatim generalities and examples have been previously encountered by the student.

As shown in Figure 1, the content dimension of the matrix involves four mutually exclusive content categories: facts, concepts, procedures, and principles. Except for facts, for which there are no generalities, all types can be tested at any of the task levels. These categories are defined as follows:

1. A fact is a one-to-one association of a symbol or name and a specific object or event. For example, the statement "the symbol for resistor is . . ." is a fact.

2. A concept is a class of objects, events, or symbols that (a) share critical attributes, (b) can be referenced by a name or symbol, and (c) have discriminably different individual members. For example, "Pumps" are objects that move fluids, are named, and have different individual members: jet pumps, centrifugal pumps, etc.

3. A procedure is a series of steps required to produce an example of an outcome class. Each step may involve the temporal or spacing ordering of specific objects, events, or symbols or a branching of decisions, based either on a fact or the classification of an example of a concept. A procedure is often characterized as "how to do something." For example, most disassembly, repair, assembly tasks involve following procedures.

4. A principle is a predictive relationship between specific examples of a concept, or among a set of related concepts, which explains why an example of a particular class is produced as a result of a particular manipulation. For example, explanations of how current, voltage, and resistance are related in a circuit involve the use of electronics principles.

Primary Presentation Forms

The ISDP defines the instructional presentation form or display as the fundamental unit of instructional strategy. As indicated previously, the instructional presentation form must meet consistency and adequacy requirements.

Four primary presentation forms (PPFs) or displays, which represent the various ways that information can be presented, have been defined:

1. Tell via generality (TG), a display that presents a definition of a concept, an algorithm that describes a procedure, or a proposition that expresses a principle.

2. Tell via example (Teg), a display that illustrates how a generality applies to a specific example.

3. Question via generality (QG), a display that requests a definition of a concept, an algorithm that describes a procedure, or a proposition that expresses a principle.

4. Question via example (Qeg), a display that presents an example and requires the student to respond to the example or presents a name or generality and requires that student to respond by providing an example.

Objective

The primary objective of this effort was to determine the effectiveness of the ISDP training manual in training participants to diagnose and recommend revisions in existing instruction. Secondary objectives were to acquire a data base for making revisions to the manual and to use these data in proposing specific revisions.

METHOD

Training Manual Lessons

The ISDP training manual was designed either to stand alone or to be used as the basis for a training workshop, depending on the sophistication of the user. It consists of seven lessons:

1. Lesson 1 provides instruction on the use of the Task/Content Matrix.

2. Lesson 2 provides detailed procedures for rating test-objective consistency.

3. Lesson 3 describes the primary presentation forms (PPFs) and the relationship between these forms and the task level.

4. Lesson 4 provides instruction and practice on (a) rating test-item-presentation consistency and (b) profiling and indexing test-item presentation consistency.

5. Lesson 5 provides instruction on how to determine adequacy at each level.

6. Lesson 6 discusses justification of task level.

7. Lesson 7 integrates the data provided in previous chapters into a general procedure for using the ISDP.

Each lesson was accompanied by practice items and a performance test.

Workshop Participants

The workshop was attended by representatives (N = 12) from the Training Analysis and Evaluation Group, Chief of Naval Technical Training, Chief of Naval Education and Training, Chief of Naval Education and Training Support, and Commander Training Command, Pacific. All were generally familiar with Instructional Systems Development (ISD) procedures, but only one had been actively involved in instructional development and evaluation. Personnel from NAVPERSRANDCEN and Courseware, Inc. conducted the workshop.

Workshop Schedule

The workshop schedule followed the lessons in the ISDP manual. Participants were encouraged to perform individual work during specified periods. After they studied each lesson and took the accompanying performance test and surveys, group discussions were held; prelesson lectures were avoided to test whether the ISDP manual was usable by itself.

Dependent Measures

Data were collected on the following variables:

1. Lesson study time.
2. Performance on practice items.
3. Test-objective consistency rating exercise.
4. Primary presentation forms identification exercise.
5. Test-presentation consistency exercise.
6. Presentation adequacy.
7. Final simulation exercise.
8. Lesson opinion questionnaire.

RESULTS

Lesson Study Time

The total contact time with the ISDP lesson materials, tests, and feedback sessions over the 5-day workshop was approximately 30 hours. Participants spent an average of 12 hours and 19 minutes on lesson materials, with a range from 9 hours and 30 minutes to 17 hours and 50 minutes. The remaining time (17-1/2 hours) was spent in tests and feedback.

Performance on Lesson Practice Items

Workshop participants were asked to tally their correct/incorrect responses to the practice items in Lessons 1 through 5. Table 1, which provides the mean percent of correct responses achieved by participants, shows that they performed fairly well on Lessons 1 through 4, but not on Lesson 5. This poor performance indicates that either the task or the instructional segment for Lesson 5 was too complex or difficult to understand, or the previous instruction did not adequately prepare the participants for competent performance. Since students cannot successfully complete Lesson 5 without a thorough understanding of constructs represented in Lessons 1 through 4, it appears that previous material was not adequate.

Table 1

Proportion of Correct Responses on Lesson Practice Items

Lesson	Mean Percent Achieved
1. Task/Content Classification	.677
2. Test-Objective Consistency	.773
3. Primary Presentation Forms	.741
4. Test-Presentation Consistency	.686
5. Presentation Adequacy	.285

Test-objective Consistency Rating Exercise

Lesson 1 taught participants to classify test items and objectives according to the task/content matrix; and Lesson 2, to determine the consistency between test items and objectives. After studying these two lessons, participants were given a list of 16 objectives and 16 test items and were directed to determine (1) the correspondence between test items and objectives, (2) the task levels and content types of test items, and (3) the task levels

and content types of objectives. Based on the proportion of correct responses from each participant, an overall reliability of .70 was achieved, which was equivalent to performance on the practice items in Lessons 1 and 2 (Table 1).

Primary Presentation Form Identification Exercise

After studying Lesson 3 on primary presentation forms (PPFs), participants were given a three-page excerpt from a Navy instructional manual. This excerpt provided ten displays--seven of which were "Tell" displays; and three, "Question" displays--outlined with a marking pen. The task was to classify each of the displays according to the type of PPF: TG, Teg, Qeg, QG, or "other." Reliability was estimated by the percent of correct classifications on all displays by all participants. The reliability for all displays was .75; for the seven TG/Teg displays, .65; and for the three Qeg/QG displays, .96. The difference in reliability between the "Tell" and "Question" displays may be because the latter provide an obvious cue or hint in prose text, while "Tell" displays do not.

Test-presentation Consistency Exercise

Decisions made about content type are often independent of the task level of the test item, while those made about the types of PPFs necessary to teach to a test item depend on its task level. Therefore, if participants chose the incorrect test item task levels, they would not arrive at the correct PPF index (see Figure 2).

After studying Lesson 4, participants completed a test-presentation consistency exercise. Only 53 of 240 responses obtained were correct, yielding a reliability measure of 22.1 percent. Participants experienced particular difficulty in classifying the task level of test items. Moreover, even when they chose the correct task level, they arrived at the correct PPF index for less than half of the items.

Presentation Adequacy Exercise

After studying Lesson 5, participants were given a segment of Navy instruction with five accompanying test items and asked to use a designated ISDP rating form to rate the instruction associated with each item. Several participants either failed to complete the rating task on all given forms or failed to respond to several questions on particular rating forms. Thus, there were several "holes" in the data for this test. The overall poor performance could be interpreted in several ways:

1. The rating forms are too difficult to use.

2. The instruction was too difficult to rate.

3. The ISDP lesson instruction had not provided sufficient practice or clarification of instructional adequacy concepts.

Also, as reported above, there were some problems with Lesson 5 practice items, as indicated by an average proportion correct of .285 shown in Table 1.

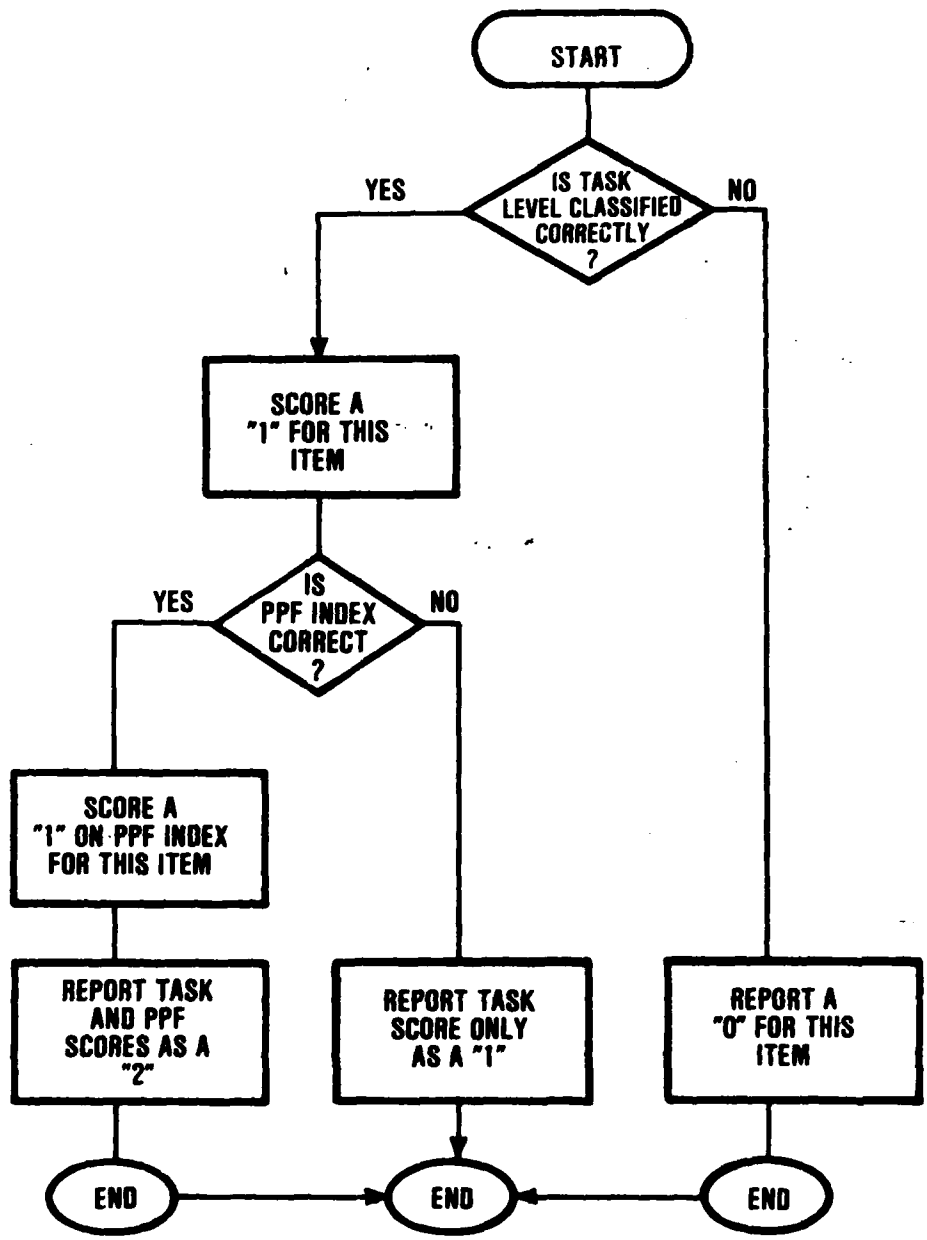

Figure 2. Flowchart of decision-making and scoring procedure for test presentation consistency index.

Final Simulation Exercise

An instructional segment of approximately 42 pages taken from a basic Navy Electronics course was used in a simulation exercise to determine whether participants had acquired the skills identified in Lessons 1 through 5. In this exercise, participants were told to consider that they were in an instructional evaluation/revision job, where they had to analyze the instruction and write a summary report to the project director for his use in proposing course improvements to the commanding officer. Also, they were permitted to decide what sequence they would follow in creating a final summary product. A latent-image response booklet was used to record each response and to direct students to the location of sections that were or were not relevant to the analysis. In making each response, the student would mark the time required, so that summary "cost-effectiveness" could be estimated based on the time spent and test scores obtained.

Table 2 provides the amount of time spent (in minutes) on the final test, along with corresponding test scores based on a rating of the effectiveness of instruction analysis. As shown, the time spent ranged from 78 to 141 minutes; and scores, from 23 to 71 (a maximum possible score was 78). The Pearson r correlation between time and performance was .05, indicating that there is no relationship between the amount of time spent and the effectiveness of the rating.

Table 2

Total Time and Score on the Final Simulation Exercise

Subject[a]	Time (minutes)	Test Score
1	85	28
2	99	91
3	97	91
4	141	37
5	78	35
6	103	29
7	100	69
8	118	54
9	86	31
10	105	41
	$\bar{X}$ = 101.2	$\bar{X}$ = 50.6

Note. Pearson r correlation between Time and Score was .05

[a]Two subjects did not complete the test.

Participants required an average time of 1 hour, 41 minutes to complete this exercise. Thus, if this lesson is considered representative of other lessons in a course of instruction, in terms of both length and complexity, and if a course consisted of 30 such lessons, it could be estimated that the actual course would require approximately 50 hours. Given that a course would best be accomplished with the help of subject matter experts working in conjunction with an instructional developer/evaluator, a total expenditure of 100 man-hours could produce a complete diagnostic profile for a course.

Some participants selected incorrect rating forms according to task levels, which indicates that Lesson 7 of the ISDP manual does not provide adequate instruction on the use of the ISDP.

However, participants had a positive attitude toward the simulation exercise, as indicated by their perseverance in performing the task and verbal statements made to workshop instructors.

Lesson Opinion Questionnaire

After studying each lesson, participants were asked to rate its adequacy in the following areas: generalities, examples, practice, feedback, graphics, overall design, importance, and strengths and weaknesses. Responses were made on a five-point Likert-type scale. Results showed that (1) the lesson examples were judged to be more effective than lesson generalities, and (2) Lesson 5 was judged to be the least adequate; and Lesson 3, most adequate. While there seems to be a relationship between participant opinion and performance, it should be noted that tasks in Lesson 5 were much more difficult than those in Lesson 3. It appears that opinions about Lesson 5 would improve if the "richness" of the instruction matched the complexity of task requirements.

DISCUSSION AND CONCLUSIONS

Training Workshop

1. Workshop Format. The workshop format for training in the use of the ISDP is a necessary adjunct to the manual. At present, the manual cannot be viewed as completely exportable or self-instructional.

2. Workshop Time. The 5-day time period for the workshop was adequate. However, if the content of the manual is improved, less time would be required. As the manual stands, mastery of ISDP techniques cannot be achieved during 1 working week. Additional on-the-job applications must be made to enhance skills acquired in the workshop. Also, since everyone does not need to master the skills, perhaps short workshops could be designed to provide managers with moderate understanding of the techniques, while longer workshops would be appropriate for curriculum designers and evaluators who would use the skills on a daily basis.

3. Performance Tests. Additional performance tests should be designed to provide other measures from diverse subject matter, content, and task types. Additional time could be spent on testing and feedback, since the feedback seemed to help participants in understanding the techniques.

4. Workshop Participants. The number of workshop participants should be limited to 10 or 12 people with fairly similar backgrounds and experience to facilitate interaction and to provide individual help. Several prerequisites should be required for participants, such as a familiarity with instructional objectives, tests, and print delivery-system type (text) instruction. Formal training in instructional technology and/or experience in ISD is necessary for successful participation.

5. Simulation. The final or posttest performance, in the form of a simulation exercise, was useful for assessing the extent to which integration of skills had been acquired. More than one posttest simulation should be provided to enhance performance. Modularly constructed simulations could be designed to provide subject matter examples that are familiar to specific participant groups, although this would take considerable effort.

6. Follow-up. Follow-up surveys or interviews should be conducted (a) to determine the extent to which ISDP techniques are used, and (b) to identify technical and management problems that are typically encountered in the process. This would allow the assessment of long-range implementation problems that cannot be evaluated in relatively short workshops.

ISDP Manual

1. Typographical and Design Errors. Since some participants were obviously distracted by the mechanical errors in the manual, future tryouts of the manual should be made with corrected copies.

2. Rating Forms. The rating forms should be standard throughout the manual, since the need to adjust to new rating forms in different lessons caused considerable confusion. Further, rating forms can be simplified without loss of information. From the comments made by the participants, this improvement would have considerable impact on whether potential users would use the ISDP procedures.

3. Terminology. Several participants found the terminology difficult to understand and use. Thus, the number of unfamiliar terms should be minimized, and when these terms are introduced, familiar usages should be chosen.

4. Examples. Example sets in the manual should focus on Navy subject matter as much as possible while maintaining diversity.

5. Paraphrase/Verbatim. It was difficult for participants to distinguish between paraphrase and verbatim statements, even when instruction was provided. Further, the significance of the distinction for instructional design was questionable. Thus, the paraphrase/verbatim distinction should be removed from the task content matrix. Only when it can be shown that different instructional presentations are required that result in different student performance can such distinctions be supported.

6. Generalities. Some generalities in the manual (such as procedures for completing rating forms) seem to be too complex or present so much information that they are not practical even when cast in the form of a procedural algorithm. These generalities would be more useful if less information were presented and alternative representations for facilitating encoding and comprehension were offered.

7. Indexing. The indexing procedure, which provided a numerical estimate of relative instructional quality, was not useful for the revision process. Revisions depend upon identifying specific problems in instruction, which was lost in the indexing. The rating forms should be designed to call for yes/no responses to questions about instructional quality, with each "no" response indicating a particular required revision.

8. General Considerations. The participants agreed that the basic assumptions of the ISDP were sound and potentially very useful in various Navy training applications. They also agreed that the manual and the workshop should be improved as described above, if the techniques are to be widely applied. Some observers were concerned about the amount of time required to analyze instruction using the ISDP. However, if conducting such an analysis leads to cost-effective revisions rather than to redesign and production of an entire course, the initial investment of analysis time could well be worthwhile. This cost-effectiveness issue should be further studied. Also, additional monitored tryouts of the technique should be conducted to obtain a more precise estimate of the time required.

RECOMMENDATIONS

It is recommended that:

1. The manual be revised as indicated in the previous section.[2]

2. Additional workshops be given to test revisions.

3. The cost-effectiveness of the ISDP process be evaluated by applying it to existing Navy courses. Analysis should be made of time required to apply the ISDP and student performance data on the revised materials.

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[2]Since the ISDP workshop was conducted and results evaluated, the Instructional Strategy Diagnostic Profile has been retitled as the Instructional Quality Inventory (IQI). Also, some recommended revisions resulting from this effort have been incorporated in the Interim Training Manual for the Instructional Quality Inventory, NPRDC Technical Note 78-5 of February 1978.

DISTRIBUTION LIST

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